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Contents

Definitions and Terminology

Physical activity – Any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level.

Exercise – Physical activity that is planned, structured, repetitive, and purposive in the sense that the improvement or maintenance of one or more components of physical fitness is the objective.

Sedentary behaviour – Any waking behaviour characterized by an energy expenditure ≤ 1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture.

General population prisoners – Regular prisoners within the prison system who are not on any special observations or punishments. They have three out of cell periods daily from 10am to 12.15pm, 2.30pm to 4pm and from 5.30pm to 7pm. Within these times they will have access to school, yards, recreation areas and gyms. These prisoners are also given the opportunity to apply for jobs with the prison in areas such as cleaning, bakery and kitchen.

Medical unit prisoners – Prisoners who are receiving care from mental health services and those awaiting admittance to the drug detox programme.

Detox prisoners – Prisoners currently engaging in a drug detox programme, who are separated from all other prisoner groups.

Protection prisoners – Prisoners who are placed on 23-hour lock up. These prisoners are segregated and kept apart from all other prisoners. They are usually given one hour out of their cells with limited access to some prison facilities.

Landing – Each wing of the prison has 3 floors (landings) which contain the prisoners' cells. The prisoner will spend most of the day here walking up and down, socialising or in around their cells. Some landings will have a recreation area with a table tennis or pool/snooker tables. Prisoners will only leave the landing if they are working elsewhere in the prison (bakery, kitchens etc.), attending school, visits or if they have access to the prison yards or gyms.

Remand – Prisoners awaiting trial for sentencing.

Lock down periods – The times when prisoners are locked in their cells.

The impact of exercise and physical activity on the physical and mental health domains of quality of life in male prisoners in Ireland

Literature review abstract

People in prison are generally deemed to be at a higher risk of several physiological and psychological conditions due to demographic factors and the prison environment, where overcrowding, lack of cleanliness and unhealthy lifestyle practices are common. In response to these influences prisoners tend to have lower quality of life and health related quality of life scores compared to the general population.

While exercise provision is in place in prisons, sedentary behaviour is very common among prisoners. Physical inactivity such as this is described as a key modifiable risk factor for several health conditions. Exercise and physical activity has been widely recognised to be effective in managing an individuals' health and the same is true in a prison perspective. Prison-based exercise programmes have increased the overall quality of life scores of prisoners most notably in the domains of physical and mental health. Cardiovascular and resistance training programmes have produced significant improvements in the cardiovascular health of prisoners reducing the risk of cardiovascular disease. Various exercise and sport interventions have also significantly improved the psychological wellbeing of prisoners reducing levels of depression, anxiety, stress and improving self-esteem.

Literature review

Introduction

Prisons are often recognised as unhealthy environments (De Viggiani, 2007) where behaviours such as drug taking, smoking and inactive lifestyles along with overcrowding (European Parliament, 2017; Mannocci et al., 2017), lack of space and fresh air (Togas, Raikou & Niakas, 2014) can lead to a high rate of physiological and psychological disorders (Battaglia et al. 2013; Battaglia et al., 2015; De Viggiani, 2007; European Parliament, 2017; Fazel, Hayes, Bartellas, Clerici & Trestman, 2016; Gulati et al., 2018; Pérez-Moreno et al., 2007) and poor overall quality of life (Digennaro, 2010; Nobile, Flotta, Nicotera, Pileggi & Angelillo, 2011; Obadiora, 2016). In addition, prisoners generally come from poorer, vulnerable and deprived social groups (Lester, Hamilton-Kirkwood & Jones, 2003; Togas et al., 2014) and are therefore at higher risk of both communicable and non-communicable diseases (Herbert, Plugge, Foster & Doll, 2012; World Health Organisation [WHO], 2013, 2014). At present there are approximately 3960 people in prison throughout Ireland, 3600 of whom are male (Irish Prison Service, 2018).

The physiological benefits associated with physical activity (PA) and exercise have been widely documented, with regular activity associated with a decreased risk of cardiovascular disease, obesity, diabetes, some cancers, hypertension and all-cause mortality (Centres for Disease Control and Prevention [CDC], 2018; U.S. Department of Health and Human Services, 2018; Warburton, Nicol & Bredin, 2006). Along with an

increased risk of the aforementioned diseases, physical inactivity has been linked with the development of mental disorders (CDC, 2018; Ströhle, 2009). Studies indicate an association between involvement in PA and improved psychological wellbeing, citing improvements in both incidence and symptoms of anxiety, depression, poor self-esteem and mood (Dunn & Jewell, 2010; U.S. Department of Health and Human Services, 2018; Ströhle, 2009; Vaiciulis, Kavaliauskas & Radisauskas, 2011).

The following review will examine the effect exercise and PA can have on the health and wellbeing of male prisoners.

Exercise and physical activity in prison

Current regulations on exercise provision in Irish prisons as detailed in the 2007 Statutory Instruments on prison rules, states that each prisoner is "entitled to not less than one hour of exercise in the open air each day", based on the practicability of the weather conditions (Department of Justice, 2007, p.29). The rules also state that based on its feasibility "each prisoner shall be permitted access to, and the use of, indoor space and equipment, suitable for physical recreation, exercise and training" (Department of Justice, 2007, p.30). These directions are in accordance with the European Prison Rules as established by the Council of Europe (2006).

Although exercise provision is in place within prisons, participation is not mandatory and opportunities for activity alongside access to facilities are dependent on the prison regime and staff availability, therefore participation can vary based on security status

and the individual prisoner involved (Choudhry, Armstrong & Dregan, 2018; WHO, 2014). Gym equipment and facilities are often limited to avoid the use of equipment as weapons to cause harm to others (Amtmann, 2001). Strength training and body building appear to be the preferred types of activities of prisoners (Battaglia et al., 2013; Elger, 2009; Filinson, 2016), with other interests including; martial arts, walking and soccer (Elger, 2009; Filinson, 2016; Martos-García, Devís-Devís & Sparkes, 2009). While current statistics for prisoner participation in Irish prisons are unavailable, the last recorded data in relation to involvement in physical education and sports was made available by the Department of Justice, Equality and Law reform in 1998 (cited in The Physical Education Development Group, 2000). At that time participation rates across the 13 Irish prisons was 26% (n = 624) of the total prison population. The rate of participation within each institution varied widely from 10.7% to 72%, influenced by the availability of facilities and prisoners' release and transfers within certain prisons.

Alongside the notable benefits of PA and exercise in physiological and psychological wellbeing (Fox, 1999; Pérez-Moreno et al., 2007; Vaiciulis et al., 2011), exercise also provides a social benefit to prisoners allowing them to strengthen social skills (Digennaro, 2010) and to establish and maintain contact with others through interaction, conversation and mutual interests (Condon, Hek & Harris, 2008; Digennaro, 2010; Lippke, 2003; Konstantinakos, Skordilis, Tripolitsioti & Papadopoulos, 2010; Martos-García et al., 2009). For many prisoners, engaging in exercise is a coping mechanism used to pass time, alleviate boredom (Gallant, Sherry & Nicholson, 2015)

and occupy the mind and body while helping them to deal with their sentence (Condon et al., 2008; Digennaro, 2010; Martos-García et al., 2009).

Quality of life in prison

Quality of life (QoL) is a broad concept, described as covering both subjective and objective evaluations of a variety of domains of human life, including physical and mental health, economic status, relationships with people and their environment (European Commission, 2018; WHO, 1997). Although many researchers (Mooney, Barry, Friel, Hannon & Kelleher, 2002; Pietersma, de Vries & van den Akker-van Marle, 2013;) have chosen to base studies on the WHO's (1997) description of QoL, there has been an overall lack of consensus in a suitable definition of the concept (European Commission, 2018; Karimi & Brazier, 2016; Post, 2014). The term Health Related Quality of Life (HRQoL) has also been used interchangeably with QoL (Karimi & Brazier, 2016; Lin, Lin & Fan, 2013; Post, 2014;). However, there are differences between these terms, with HRQoL focusing more on the impact of health status and wellbeing on an individual's overall QoL (CDC, 2016; Guyatt, 1997; Office of Disease Prevention and Health Promotion, 2010; WHO, 1997) in the absence of other measures such as environmental, financial and religious influences (European Commission, 2018; WHO, 1997). Among various studies, physical and mental health have both been identified as common domains of QoL and HRQoL assessments (European Commission, 2018; Guyatt, 1997; Lin et al., 2013; Pietersma et al., 2014).

Notwithstanding the above, in prisons, QoL adopts a different perspective. In environments where space is restricted, and rules are imposed and governed by others, individuals have less personal control over their health needs (McNamara & Mannix-McNamara, 2014) and their resulting QoL. Studies have shown that prison populations generally have lower levels of perceived QoL and tend to view their lives in a negative manner (Digennaro, 2010; Johnsen, Granheim & Helgesen, 2011; Kalonji, Ngongo, Illunga, Albert & Giet, 2017). In a 2011 study of male prisoners in Italy, 43.5% of participants (n = 602) rated their QoL as poor (Nobile et al., 2011), while Kalonji et al. (2017) reported a negative self-perceived QoL in 75% of prisoners in the Democratic Republic of Congo.

Research on prison staff cultures have found that the relationship between prison staff and prisoners is one of the key components that influences the prison environment and resulting QoL of prisoners (Crewe, Liebling & Hulley, 2011; Johnsen et al., 2011; Liebling, Price & Elliott, 1999). Increased punitive and defensive behaviours from prison staff have been shown to have an adverse affect on prisoner QoL (Crewe et al., 2011). Prisoners have identified feelings of respect, fairness, trust and being cared for, as qualities that affect their relationships with prison staff (Crewe et al., 2011; Liebling & Arnold, 2002). This relationship has been acknowledged as outweighing other material aspects of prison life quality such as prison design and size (Crewe et al., 2011, Johnsen et al., 2011). Social interactions such as these have been identified as a direct influence on the life satisfaction of individuals (European Commission, 2018). Although not as influential in affecting prisoner QoL, smaller prisons have been linked to more

positive perceptions of prison life compared to experiences in larger establishments (Booth, 2009; Johnsen et al., 2011). However, it is possible that increased positivity may be a result of stronger relationships with prison staff, where prisoners are less likely to be overlooked in a more crowded system. Understandably sentence length and age demographics are also recognised as factors affecting QoL in prison, where individuals over the age of 30 and those with sentences greater than six months were shown to have significantly lower QoL scores ($p < .05$) (Kalonji et al., 2017). The use of the WHO's QoL instrument (WHOQOL-BREF) also identified a poor overall QoL in drug-using prisoners in Ireland (Mooney et al., 2002). While female prisoners showed significantly lower scores in the psychological and physical domains of the QoL assessment than their male counterparts, drug-using male prisoners had a significantly lower total QoL score than non-drug using male prisoners. De Maeyer, Vanderplasschen and Broekaert (2009) have acknowledged the negative effect of drug use on QoL, especially in the mental health domain in members of the general population but have also stated that it is unclear if the effects are attributed to the use of the drugs or to the negative life events associated with drug use. This is also an issue that is questionable in prison settings as drug use, alcohol and smoking are some of the aspects of the lifestyles that prisoners are known to adopt which can be hazardous to both their physical and mental health (Davoren et al., 2015). The continued use of illegal drugs is common among prisoners (Lester et al., 2003). Togas et al. (2014) has identified a negative association between use of drugs and HRQoL in a study of male Greek prisoners, stating that the negative association became more significant as the duration of drug use increased. In a retrospective review of two Irish remand prisons

between 2006 and 2012, younger prisoners (32%) were significantly more likely to have a history of the misuse of illicit drugs when compared to older prisoners (8%) aged 60 and above ($p < .001$) (Davoren et al., 2015).

When the common domains of QoL and HRQoL are examined, it is evident that prisoners are at a greater risk of physiological and psychological disorders and diseases (Fazel & Baillargeon, 2011; WHO, 2014). While it is understood that not all of these conditions can be cured by exercise participation alone, evidence has shown that some symptoms and risks can be alleviated through involvement in regular PA and exercise, which can in turn indirectly improve the individuals' QoL (Cashin, Potter, Stevens, Davidson & Muldoon, 2008; Fox, 1999; Gallant et al., 2015; Obadiora, 2016; Pérez-Moreno et al., 2007; Vaiciulis et al., 2011). Mannocci et al. (2017) found a significant association between weekly PA levels (Metabolic Equivalent [MET]) and both the physical ($r = .165$; $p = .001$) and mental ($r = .099$; $p = .048$) component scores of the Short Form 12 (SF-12) HRQoL assessment. The study also concluded that weekly PA (> 600 $MET \cdot wk^{-1}$) was associated with higher levels in both domains of QoL.

Exercise / Physical Activity and Physical Health

Studies have shown that prisoners are more likely to present with communicable diseases such as; human immunodeficiency virus (HIV), hepatitis B and C and tuberculosis (Dolan et al., 2016; European Centre for Disease Control and Prevention, 2017; Pérez-Moreno et al., 2007; WHO, 2014). Incidence of non-communicable diseases like hypertension (Arries & Maposa, 2013; Colsher, Wallace, Loeffelholz &

Sales, 1992), cardiovascular disease (CVD) (Arries & Maposa, 2013;) and diabetes (Binswanger, Krueger & Steiner, 2009) are also more common among prisoners (WHO, 2014; Wilper et al., 2009). Physical inactivity has been widely identified as a key modifiable risk factor for these non-infectious diseases (Herbert et al., 2012, WHO, 2003) and is an important factor in alleviating these conditions while imprisoned (Gómez & Bravo, 2018; Vera-Remartínez, 2018; WHO, 2014). Although extensive research has been carried out on the impact of exercise on prisoners' psychological health, less research is available on the effects of exercise on their physical health. This may be due in part to the difficulty of undertaking physiological testing within a prison setting. However, of the studies available, positive results relating to several non-communicable health conditions are evident.

Following a nine-month progressive exercise intervention consisting of cardiovascular and resistance training (CRT) and high intensity strength training (HIST), Battaglia et al. (2013) concluded a significant increase in the cardiorespiratory capacity and a decrease in cardiovascular disease risk ($p < .01$) of male prisoners compared with controls. Both training protocols produced significant improvements in pulse oximetry testing (SpO_2) (CRT:96.6 – 98.6; HIST: 97.8 – 98.6; $p < .05$) used to measure the oxygen saturation of the blood. Battaglia et al. (2013) identified CRT as the most effective training method for prisoners to achieve the greatest results. Overall results from the CRT training group also produced significant decreases in the body mass index and the systolic and diastolic blood pressures of participants. Similarly, a four-month cardiovascular and resistance training programme undertaken by Pérez-Moreno et al.

(2007) in a Spanish prison produced significant improvements in the cardiorespiratory capacity of male participants compared with controls. Significant increases ($p < .01$) using cycle ergometer testing from baseline measurements were evident in peak-completed workload (pre: 150 ± 10Watt [W]; post: 172 ± 9W), peak heart rate (HR_{peak}) (pre: 154 ± 4 $b \cdot min^{-1}$; post: 164 ± 3 $b \cdot min^{-1}$) and HR decline one minute post exercise compared to attained HR_{peak} (pre: 16 ± 3 beats; post: 26 ± 4 beats) in the training group after completion of the programme. The intervention also demonstrated significant improvements ($p < .01$) in the QoL of the training group (pre: 76 [49 – 83]; post: 87 [59 – 96]) while the control group showed no change from baseline (pre: 76 [53-102]; post: 77 [56 – 93]) (Pérez-Moreno et al., 2007).

The physical inactivity of prisoners is a factor that must not be overlooked in the discussion of physical health. Prison environments are characterised by extended periods of inactivity and sedentary behaviour (Battaglia et al., 2013; de Viggiani, 2007; Martos-García et al., 2009; Meijers, Harte, Meynen, Cuijpers & Scherder, 2018) usually during “lock down” periods where prisoners have large amounts of time sitting or television viewing in confined cells (Elger, 2009). However, as stated, inadequate PA has been identified as a key modifiable risk factor for non-communicable diseases (Herbert et al., 2012; WHO, 2003, 2014). Evidence from several studies and meta-analyses identified significant relationships between several diseases and greater time spent in sedentary activities, linking inactivity and higher all-cause mortality, mortality from cardio-vascular disease, risk of type 2 diabetes, risk of incident cardiovascular disease and mortality from cancers such as colon and lung (Biswas et al., 2015; Ekelund

et al., 2016; Grøntved & Hu, 2011; Howard et al., 2008; Shen et al., 2014; Ukawa et al., 2013; Wilmot et al., 2012). Pooled results from a systematic review by Wilmot et al. (2012) associated greater sedentary time with a significantly increased risk of cardiovascular disease (Relative Risk (RR): 2.47, 95% Confidence Interval (CI): 1.44 – 4.24), diabetes (RR: 2.12, 95% Credible Interval (CrI): 1.61 – 2.78), mortality from cardiovascular disease (Hazard Ratio (HR): 1.90, 95% CrI: 1.36 – 2.66) and all-cause mortality (HR: 1.49, 95% CrI: 1.14 – 2.03).

One of the main sedentary activities undertaken by prisoners is television viewing (Elger, 2009). However greater time spent watching TV has been linked to an increased risk of cancer incidence (RR: 1.21, 95% CI: 1.08 – 1.35) (Shen et al., 2014) and a high relative risk of colon cancer (RR: 1.61, 95% CI: 1.14 – 2.27) for viewing of ≥ 9 h·day compared with < 3 h·day (Howard et al., 2008). A 36% risk for lung cancer diagnosis in males was also observed in TV viewing for > 4 h·day compared to < 2 h·day (HR: 1.36, 95% CI: 1.04 – 1.80) (Ukawa et al., 2013). Linear dose responses were also evident in research by Grøntved and Hu (2011) for increased TV viewing and higher risk of Type 2 diabetes (RR: 1.20,95% CI: 1.14 – 1.27, $p < .001$), increased risk of fatal and non-fatal cardiovascular disease (RR: 1.15, 95% CI: 1.06 – 1.23, $p < .001$) and increased risk of all-cause mortality (RR: 1.13, 95% CI: 1.07 – 1.18, $p < .001$) for every two-hour increase in TV viewing per day ($p < .001$).

It was acknowledged however, that in the case of all-cause mortality, the relationship between sedentary behaviours such as sitting and television viewing, varied based on

the amount of moderate to vigorous activity undertaken by the individual (Biswas et al., 2015; Chau et al., 2013; Ekelund et al., 2016). When increased sitting time was measured alongside increased activity levels, an almost curvilinear augmented risk for all-cause mortality was observed in each study. It was identified that the relationship was stronger for all-cause mortality in those who had low amounts of moderate to vigorous PA alongside greater amounts of sitting time (Biswas et al., 2015; Chau et al., 2013; Ekelund et al., 2016). A hazard ratio of 1.59 (95% CI: 1.52 – 1.66) was identified by Ekelund et al. (2016) for individuals with the lowest measure of PA (<2.5 MET h·wk) and > 8 hours sitting time per day. In contrast the analysis showed no significant relationship between mortality rates and the amount of time sitting in the most active participants (>35.5 MET h·wk) regardless of sitting time, suggesting that the increased risk of prolonged sitting on mortality was eliminated by high PA involvement. Similar results were noted in a meta-analysis of sedentary behaviour by Biswas et al. (2015) with a 30% lower relative risk of all-cause mortality seen in individuals with higher PA levels (HR: 1.16, 95% CI: 0.84 – 1.59) in comparison to a hazard ratio of 1.46 (95% CI: 1.22 – 1.75) seen in those with lower levels of PA.

Alongside all-cause mortality, exercise and PA has also been seen to influence the prevalence of other non-communicable diseases. In relation to mortality from cardiovascular disease, Ekelund et al. (2016) concluded that people with the lowest moderate – vigorous activity levels (25 – 35 min·day, 16 MET h·wk and = 5 min·day, ≤ 2.5 MET h·wk) had a 23 – 74% higher mortality rate compared to the most active individuals (60 – 75 min·day, >35.5 MET h·wk) sitting less than 4 h·day. Cancer risk was

also seen to decrease alongside exercise, with men who exercised five or more times a week acknowledged to have a 21% lower risk of developing colon cancer (RR: .79, 95% CI: 0.68 – 0.91, p = .001) than those who rarely or never undertook exercise (Howard et al., 2008).

Exercise / Physical activity and mental health

In 2016 an Irish health survey reported that 10% of the population indicated a probable mental health problem based on a negative mental health score of 56 or lower on the Mental Health Index-5 (MHI-5), a rise of 1% from the previous year (Healthy Ireland, 2016). While these figures show the incidence of mental health related problems among the Irish population, evidence has shown that the prevalence of mental distress and disorders is higher among prisoners than the general population (Australian Institute of Health and Welfare (AIHW), 2013; Condon et al., 2008; Fazel et al., 2016; Mills & Kroner, 2005). Affective disorders such as depression have been identified among male prisoners in Ireland (Gulati et al., 2018) with results of an Irish prison healthcare survey, revealing 22% of males reporting depressive symptoms in the previous 12 months (The Minister of Justice, Equality and Law Reform, 2000). Older male remand prisoners (40%, n = 62) were more likely to be diagnosed with an affective illness compared to younger males (17%, n = 27) ($p < .001$) (Davoren et al., 2015).

Similar results have been acknowledged globally. The U.S Department of Justice (2006), identified the breakdown of male prisoners experiencing mental health

problems in local jails and state prisons as 63% and 55% respectively. These statistics are also reflected in the 2015 Australian Government report on the health of prisoners where 40% of male entrants and 47% of those discharged from prison reported a history of mental health problems (AIHW, 2015). Figures from a French prison have revealed a high level of depressive and anxiety symptoms among male prisoners compared to the norms from healthy populations (Lagarrigue, Ajana, Capuron, Féart & Pierre Moisan, 2017). This same study also revealed that 33.3% of male inmates had severe depressive symptoms. Assessments of depression, state-trait anxiety, self-esteem and QoL in an Australian prison by Gullone, Jones and Cummins (2000) found that the prison sample scored lower on self-esteem and subjective QoL with QoL levels below the norm. The sample also scored higher on both state and trait anxiety and depression. When the depression results were examined further, similar results to those seen by Lagarrigue et al. (2017) indicated that 38% of prisoners experienced moderate to severe depression. It is worth noting however that female prisoners have displayed higher rates of mental health problems compared to their male counterparts (AIHW, 2015; Mooney et al., 2002).

Several positive benefits on the psychological wellbeing of prisoners have been linked to involvement in a variety of forms of exercise and PA (Gallant et al., 2015; Woods, Hassan & Breslin, 2017). Mannocci et al. reported a direct association between the Mental Component Score (MCS) of the SF-12 HRQoL questionnaire and the MET score of the International Physical Activity Questionnaire (IPAQ) ($r = .25$, $p = .02$; $r = .099$, $p = .048$) in Italian male prisoners in 2015 and 2017 respectively. A similar relationship was

observed following a 10-week sports participation study in a Nigerian prison where the experimental group of participants (n = 45) displayed improved QoL scores on the WHOQOL-BREF compared with the control group (Obadiora, 2016). The greatest improvements were seen in the psychological wellbeing domain (p = .06).

In a recent study on the effects of a three-month resistance and cardiovascular exercise intervention on a sample of male prisoners (n = 30) in Ireland, O'Toole, Maguire and Murphy (2018) reported a significantly positive change in 81% of the post-intervention symptom scores for self-reported assessments of depression, anxiety, stress, anger and self-esteem. Similar global research has also shown positive associations between exercise and PA and prisoner's mental health. In a supervised nine-month exercise training programme involving male prisoners in Italy, Battaglia et al. (2015) reported positive effects on the mental wellbeing of participants. Following the programme, analysis of a self-assessed psychological questionnaire (Symptom Checklist-90-Revised) revealed significant improvements in depression scores in both exercise groups (CRT; HIST) compared with the control group (C), (CRT: 0.26 ± 0.40 vs C: 0.77 ± 0.87, $p < .05$; HIST 0.24 ± 0.27 vs C: 0.77 ± 0.87; $p < .01$). Based on the scores of the questionnaire the CRT group also showed significant decreases in the Global Severity Index scores (0.42 ± 0.55 to 0.26 ± 0.40; $p < .01$) and interpersonal sensitivity levels (0.40 ± 0.77 to 0.24 ± 0.66; $p < .01$) from pre to post training. The HIST group analysis revealed significant decreases in levels of anxiety (0.55 ± 0.56 to 0.25 ± 0.29, $p < .05$) and phobic anxiety (0.27 ± 0.49 to 0.03 ± 0.08, $p < .05$), while the CRT group showed almost significant results for decreasing anxiety levels (0.37 ± 0.60 to 0.22 ±

0.40, p = .06) following the programme. Significantly lower levels of depression (mean [M]: 12.86, standard error of mean [SEM]: 2.23) and stress (M: 8.6, SEM: 5.78) were also reported in an exercising group of male prisoners in the United States (US) (n=30) when compared to a non-exercising group (n=30) (M: 22.46, SEM: 1.6; M: -19.5, SEM: 6.68) following a Becks Depression Inventory II (BDI-II) assessment and a Life Experiences Survey (Buckaloo, Kung & Nelson, 2009). The same study also declared near significant scores (p = .09) for the Daily Hassles Scale assessment of exercising versus non-exercising prisoners (M: 52.56, SEM: 8.94; M:78.53, SEM: 8.55) relating to the frustrating and distressing demands of their everyday lives. Whilst the analysis showed no clear relationship between the type of exercise and number of sessions versus lower depression and stress levels, the research did indicate that participants who exercised between 35 and 59 minutes were those who also scored lowest on the BDI-II assessment (Buckaloo et al., 2009). Involvement in a 10-week yoga course by prisoners in the UK has also reported a significantly higher (p = .014) positive affect as measured by The Positive and Negative Affect Scale compared to the control group post intervention (Bilderbeck, Farias, Brazil, Jakobowitz & Wikholm, 2013). Post intervention analysis by Bilderbeck et al. (2013) also revealed significant decreases in participants' perceived stress (p < .001) and psychological distress (p = .008) from baseline and when compared to the control group (p = .041; p = .037). Participation in sport and exercise in prison has also been identified through additional studies as leading to feelings of increased self-esteem and happiness (Gallant et al., 2015, Vaiciulis et al., 2011), reduced feelings of tension, anxiety, stress and hopelessness

(Cashin, Potter & Butler, 2008; Gallant et al., 2015) and has been acknowledged as helping prisoners to "get through the day" (Woods et al., 2017, p. 158).

Conclusion

The HRQoL and QoL of prisoners has been identified as being lower than the general population. These poorer levels can be influenced by several socio-economic factors and by the environment and lifestyles associated with prison itself. Although physical and mental health are only two aspects of HRQoL and QoL, they can be positively influenced by prisoners participating in regular PA and exercise. Researchers (Mannocci et al., 2017) have identified weekly exercise levels of > 600 METs to be sufficient at improving prisoners' QoL scores in these areas, while exercise duration of between 35 and 59 minutes has been seen to be significant at lowering the effects of depression in prisoners (Buckaloo et al., 2009). When different methods of exercise training were tested, the combination of cardiovascular and resistance training was deemed the most effective at improving elements of physical and mental health among the prison population (Battaglia, 2013, 2015).

The use of exercise to improve prisoners' health requires greater emphasis especially within the Irish prison system. Global studies on the effects of exercise on mental health have shown significant improvements for prisoners and their QoL. However, there is a considerable lack of similar research within Ireland. Currently only one intervention has examined the use of exercise in the psychological well-being of Irish prisoners (O'Toole et al., 2018) in only one of the twelve Irish prisons. No research is

currently available from Ireland on the effects of exercise and PA on physical health and research in this area is also limited worldwide.

The HRQoL of prisoners is an area that allows for future studies. While the aspects of physical and mental health have been discussed here, it is possible to delve further into these domains and investigate how they can in turn impact on the QoL domain of social functioning and social relationships within the prison setting. Although the focus of this review has been on male prisoners, it has been acknowledged that female prisoners have significantly lower QoL scores in the physical and mental health domains (Mooney et al., 2002), however they are under-represented in the research to date.

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Exercise and physical activity practices of males in an Irish prison and its impact on quality of life.

Word count: 4478

Key words: Quantitative analysis, Physical activity energy expenditure, Sedentary behaviour, Mental health

Journal choice

The International Journal of Prisoner Health

This journal provides an interdisciplinary focus on the health of people at all stages of the criminal justice system, including prisoners in both remand and sentenced prisons. The main topics discussed in the journal include health and illness among prisoners and prisoner wellbeing, making it a suitable choice for the current study. This journal has also recently published the first Irish study on the positive effects of exercise on the mental health of male prisoners.

Research article abstract

Background and Aims

The health and quality of life (QoL) of prisoners is typically lower than the general population. Prison-based studies, support the research that exercise and physical activity (PA) contribute to improvements in the physiological and psychological health aspects of QoL. Assessment on this relationship however, are scarce in Ireland. This study aims to provide an insight into the exercise and PA habits of male prisoners in Ireland and its impact on their perceived QoL.

Methods

Prisoners from Mountjoy male prison, were invited to participate on a voluntary basis. Questionnaires assessing PA levels (RPAQ) and QoL (SF-12v2) were distributed among the sample.

Results

84 prisoners participated in the study. The SF-12v2 provided QoL measures for physical (50.56; 27.93 – 66.53) and mental health domains (MCS) (48.74 ± 9.71), with the MCS measure slightly below the norm. A positive correlation was seen between PA energy expenditure levels ($kj \cdot kg^{-1} \cdot day^{-1}$) from the RPAQ and the MCS measure of QoL ($r = .224$; $p = .041$), while a negative relationship was observed between sedentary behaviour and the MCS measure ($r = -.22$; $p = .45$).

Conclusions

Post-intervention analysis of prison-based PA programmes has shown positive results especially in the mental health domain of QoL, citing improvements in the areas of depression, anxiety, stress, anger and self-esteem. In contrast, sedentary behaviours such as tv viewing have been directly associated with psychological distress and evidence has linked the behaviour to issues such as depression and anxiety.

Research article

Introduction

Research on prison populations has shown that the self-perceived quality of life (QoL) and health-related quality of life (HRQoL) of prisoners is generally lower than normative standards for the general population (Gullone, Jones & Cummins, 2000; Kalonji, Ngongo, Illunga, Albert & Giet, 2017; Nobile, Flotta, Nicotera, Pileggi & Angelillo, 2011). Several factors including the prison environment (European Parliament, 2017; Togas, Raikou & Niakas, 2014), relationships with prison staff (Crewe, Liebling & Hulley, 2011; Johnsen, Granheim & Helgesen, 2011; Liebling, Price & Elliott, 1999) and the behaviours and lifestyle choices of prisoners (Davoren et al., 2015; Mooney, Barry, Friel, Hannon & Kelleher, 2002) have been cited to be influential in affecting the QoL of prisoners. In addition, people in prison generally come from disadvantaged and lower socio-economic backgrounds (Binswanger, Krueger & Steiner, 2009; Di Viggiani, 2007; McNamara & Mannix-Mc Namara, 2014) and are at a higher risk of physiological and psychological diseases and disorders (Australian Institute of Health and Welfare [AIHW], 2013; Fazel, Hayes, Bartellas, Clerici & Trestman, 2016; Herbert, Plugge, Foster & Doll, 2012; Lester, Hamilton-Kirkwood & Jones, 2003; World Health Organisation [WHO], 2014).

Involvement in exercise and physical activity (PA) has been widely recognised as an effective means of improving physical and mental health (Centres for Disease Control and Prevention [CDC], 2018; Fox, 1999; Ströhle, 2009; WHO, 2003). The positive

impact of exercise and PA on prisoner health has also been acknowledged (Cashin, Potter, Stevens, Davidson & Muldoon, 2008; Vaiciulis, Kavaliauskas & Radisauskas, 2011). Although not widely available, several prison-based exercise and PA interventions have reported significant improvements in aspects of physical and mental health and in turn QoL (Battaglia et al., 2013; Battaglia et al., 2015; Bilderbeck, Farias, Brazil, Jakobowitz & Wikholm, 2013; Buckaloo, Kung & Nelson, 2009; Cashin, Potter & Butler, 2008; Mannocci et al, 2017; Obadiora, 2009; Perez-Moreno et al., 2007).

Extended periods of sedentary behaviour, are generally associated with prisons (Martos-García, Devís-Devís & Sparkes 2009; Meijers, Harte, Meynen, Cuijpers & Scherder, 2018). Inactivity such as this has been identified as a key modifiable risk factor for many of the non-communicable diseases that commonly affect the prison population (Herbert et al., 2012; WHO, 2003, 2014).

While there has been global evidence on the effects of exercise on prisoner health, similar research and studies are lacking from an Irish context. A recent exercise intervention by O'Toole, Maguire and Murphy (2018), became the first Irish based study to assess the effects of exercise on prisoners' mental health.

The aim of the current study is to examine the association between exercise and PA levels and perceived HRQoL of adult male prisoners in an Irish prison. There are currently in the region of 3600 males imprisoned in Ireland (Irish Prison Service,

2018a). The research will aim to provide an insight into their exercise and PA behaviours with the hypothesis that exercise / PA will have a positive effect on the QoL of male prisoners.

Methods

The research was approved by the research ethics committees of the Irish Prison Service and the University of Chester prior to commencement (see Appendix A, B).

Setting

The research was conducted between March and April 2018 in Mountjoy prison, a closed, medium security prison for adult males. Mountjoy is the main committal prison for Dublin city and county with capacity for 554 prisoners (Irish Prison Service, 2018b). The prison currently houses general population prisoners with no special conditions and prisoners on varied levels of protection where out of cell time is often reduced to just one hour per day. Access to the prison landings was approved by the chief security officer of the prison.

Daily access to physical activity and exercise is required under the prison rules by the Department of Justice (2007). According to these rules prisoners are allowed not less than an hour of daily exercise in the open air and access to indoor space and equipment for recreation, exercise and training. Facilities available in Mountjoy prison include exercise yards, gyms and recreational areas where activities such as pool, snooker and table tennis are available. The prison also accommodates several fitness

classes such as circuit training, boxercise, yoga and pilates which are provided by the education services and the prison gym officers. Under the current prison regime general population prisoners are given three daily unlock periods of between one and a half to two hours where they can access these facilities. The facilities are offered based on staff availability and security status and as a result may not be available every day or at every unlock period. If a prisoner refuses to attend any of the facilities during these times, they are required to return to their cells and are subsequently locked up. Some prisoners are also allocated work within the prison; in the kitchen and bakery areas or as cleaners on their landings. These prisoners are allowed more out of cell time to complete their tasks, however their access to exercise facilities is lessened due to their working hours.

Participants

The study excluded prisoners who were on varied levels of protection, in the prison's medical unit and those on drug detox programmes. The remaining general population of prisoners (n = 239) were invited to participate anonymously in the study on a voluntary basis. Participants received no special privileges for involvement in the study and no punishment was given to those who declined to participate. Written informed consent was obtained from all participants (see Appendix G).

Procedure

Self-assessed questionnaires relating to PA levels and HRQoL were collected from participants. A projected sample size of 84 was calculated using a G*Power calculation (G*Power 3.1.9.2), based on a moderate effect size of 0.30 (Cohen, 1992).

Due to the sensitive nature of some of the questions in the study, the psychology services within the prison were informed of the research and were available to provide counsellor assistance to participants if required. Leaflets were also provided to participants with information on how to access mental health services within the prison (see Appendix F).

Access to prisoners was limited due to the time constraints of the prison regime, so it was deemed appropriate to meet with potential participants in the weeks prior to the distribution of questionnaires to inform them of the research and to invite them to take part. During these visits to the prison landings the researcher spoke with prisoners and circulated invitation letters and participant information sheets (see Appendix C, D). The researcher was also available to discuss the research with prisoners who had literacy difficulties. Posters were displayed on the appropriate landings as a reminder of the date and time of questionnaire distribution (see Appendix E).

On the days assigned to distribute questionnaires, the researcher attended the landings during the morning and afternoon unlock periods. During this time, prisoners

have approximately 20 minutes to socialise on the landing before being moved to the prison facilities such as the exercise yard, school, gym or locked back in their cells. Consent forms and questionnaires were distributed to willing participants during these periods. Individuals filled out the consent forms and questionnaires immediately and returned them once complete. Prisoners with literacy difficulties were invited to complete the questionnaires verbally with the researcher recording their answers.

Questionnaires

A total of three questionnaires were used as part of the study (see Appendix H). Modified versions of the Recent Physical Activity Questionnaire (RPAQ) and the Short Form 12v2 (SF-12v2) Quality of Life questionnaire were distributed along with a general demographic set of questions.

It has been identified that people in prison are more likely to have poor literacy skills compared to the general population (Digennaro, 2010; McNamara & Mannix McNamara, 2014; Morgan & Kett, 2003). The last recorded survey of adult literacy within Irish prisons was undertaken in 2001 and revealed that 52.8% of males had literacy skills at level one or lower (Morgan & Kett, 2003). These findings are in stark contrast to the most recent results from an assessment of adult competencies, which reported only 17.9% of Irish adults in the general population scoring within the same literacy levels (Central Statistics Office, 2013). This issue of literacy difficulty was considered when producing materials for distribution to allow for greater understanding by participants. The questionnaires and materials distributed were

printed on matt pale-yellow paper using clear sans serif fonts suitable for people with literacy difficulties. These guidelines have been recommended for adults with literacy difficulties to reduce glare and to allow for easier readability (Dyslexia Association of Ireland, 2018; National Adult Literacy Association [NALA], 2011; 2018).

RPAQ

The RPAQ is a recall-based set of questions that inquires about PA across four domains (leisure time, occupation, commuting and domestic life) during the past four weeks (University of Cambridge, 2015). The questionnaire is divided into three sections: activity patterns in and around the home; travel and activity at work and recreational activities engaged in during the last four weeks. In the context of the current study the wording was modified to reflect the prison environment and questions about travel and commuting to work were omitted along with activities not available in the prison. These questions were however included in the overall analysis of the research and given the appropriate coded values where absent.

SF-12v2

The SF-12v2 is a set of 12 questions which evaluates an individual's HRQoL over eight health domains: Physical functioning, role participation with physical and emotional health problems, bodily pain, general health, vitality, social functioning and mental health (Maruish, 2012). Assessments of these eight domains are combined to provide two overall health calculations: Physical and Mental Component Summary measures. High summary scores of each component correspond to high levels of physical /

mental health and fewer functioning limitations in the respective areas. Alterations to the wording of some questions were made to make it appropriate for the prison environment and for people with lower literacy levels.

Demographic Questionnaire

A short set of questions were included to determine age, sentence length, educational background and exercise / PA involvement prior to entry into prison

Validity

Both the RPAQ and the SF-12v2 have shown adequate reliability and validity (Besson, Brage, Jakes, Ekelund & Wareham, 2010; Cheak-Zamora, Wyrwich & McBride, 2009; Golubic et al., 2014; Schmidt et al., 2012) in a variety of populations. Although use of the SF-12 is common in prison research, no validation studies of either assessment tool have been undertaken in a prison setting.

Statistical Analysis

Scoring of the RPAQ and the SF-12v2 were completed using Stata IC software (version 15) and Optum Pro Core (version 1.1) respectively. These results were uploaded into SPSS (version 24) along with the demographic questionnaire responses for further analysis.

Descriptive statistics were calculated for the demographic questionnaire and the scores of both the RPAQ and SF-12v2 with measures of central tendency and variability

dependant on the normal distribution of the data determined by the Sharpio-Wilk test of normality. Frequency rankings were calculated for exercise levels before prison and to determine the prevalence of activities currently undertaken by participants. Bivariate analysis was undertaken separately for each of the QoL summary measures and RPAQ scores including; total physical activity energy expenditure (PAEE), total metabolic equivalent (MET) and total hours of activity. Activity time and METs was also examined against QoL values at each of the intensity levels along with analysis of PAEE from home, work and leisure domains. Where the data was normally distributed Pearson's correlation was conducted, while Spearman's correlation was used for all data that failed this assumption. A significance level of $p \leq .05$ was used throughout the analysis.

Results

A total of 99 questionnaires were returned from seven landings of general population prisoners, yielding a usable sample of 84. Fifteen of the returned questionnaires were incomplete and deemed void.

Demographic

The median age of participants was 34 years ranging from 21 to 58 years, with 61% of the overall sample currently serving a sentence of up to five years (n = 47). The median age at which participants left school was 15, however, this figure ranged greatly between ages seven and 23.

Exercise and Physical Activity

Results from the RPAQ determined the median total PAEE of participants to be 44.36 $kj \cdot kg^{-1} \cdot day^{-1}$, however, there was a large spread in the scores with the energy expenditure (EE) of the most inactive participant as low as 0.43 $kj \cdot kg^{-1} \cdot day^{-1}$ while EE reached a score of 131.57 $kj \cdot kg^{-1} \cdot day^{-1}$ for the most active. The home domain of the questionnaire produced the least amount of EE overall for the sample (median: 0.43 $kj \cdot kg^{-1} \cdot day^{-1}$; 0.00 to 16.02 $kj \cdot kg^{-1} \cdot day^{-1}$) while the greatest spread of PAEE scores was seen in the leisure domain (median: 22.62 $kj \cdot kg^{-1} \cdot day^{-1}$, 0.00 to 128.21 $kj \cdot kg^{-1} \cdot day^{-1}$).

Mean values for total MET hours per day equalled 21 ± 9.8 $METhr \cdot day^{-1}$, while the mean for total hours active was 10 ± 3.75 $hr \cdot day^{-1}$. Further investigation into these results revealed that although the highest EE was produced at the moderate intensity level (median: 7.3 $METhr \cdot day^{-1}$, 0.12 to 37.62 $METhr \cdot day^{-1}$), participants spent on average more time sedentary, excluding sleep per day (median: 6 $hr \cdot day^{-1}$, 0 to 16 $hr \cdot day^{-1}$) compared to time spend at other intensities.

Eighty one percent of participants (n = 68) described themselves as active before entry to prison. The majority participated in exercise most days of the week (n = 20, 23.8%) with moderate intensity exercise the most common (n = 30, 35.7%). Since coming to prison, 76% (n = 64) of the sample have changed their activity levels. Participant responses to changes in activity levels varied from negative comments relating to the limited availability of activities and gym facilities, and personal stressors to more positive comments where exercise has been used as a tool to overcome boredom and

pass time, and to improve health in the absence of drugs (see Appendix I). The most common activities undertaken by participants include; walking (n = 68), weight training (n = 55), conditioning exercises using the bike or rower (n = 35) and jogging (n = 35).

Forty four percent (n = 37) of the sample have jobs within the prison, with the majority undertaking what they describe as manual work (n = 25). Over the previous four weeks participants worked 29 ± 17 hours weekly. The median PAEE exerted by those who work was 29.36 $kj \cdot kg^{-1} \cdot day^{-1}$ (3.05 to 96.15 $kj \cdot kg^{-1} \cdot day^{-1}$).

Quality of Life

Values for the Physical Component Summary (PCS) measure (median: 50.56; 27.93 – 66.53) were closely aligned with the linear t-score of 50 ± 10 for each health domain score and component summary measures of the SF-12v2 based on the 2009 U.S. general population (Maruish, 2012), while the Mental Component Summary (MCS) measure (mean: 48.74 ± 9.71) was slightly below. Further exploration of the data revealed that the highest scoring domain of the participants' combined data was the vitality domain (median: 58.90; 39.23 – 68.74) relating to an individuals' level of energy, while the lowest was the role emotional domain (median: 45.89; 14.7 – 56.28) which assesses how often the respondents' emotional problems cause limitations to work or activities.

Correlations

Spearman's rho correlation revealed a low positive relationship between PAEE ($kj \cdot kg^{-1} \cdot day^{-1}$) and the MCS measure of QoL ($r = .224$; $p = .041$; $r^2 = 5\%$). A significant relationship was also seen between sedentary behaviour EE ($METhr \cdot day^{-1}$) and the MCS measure where a low negative correlation was observed ($r = -.22$; $p = .45$; $r^2 = 4.84\%$). Time spent sedentary, excluding sleep ($hr \cdot day^{-1}$) showed an almost significant low negative correlation with the MCS measure ($r = -.21$; $p = .055$; $r^2 = 4.41\%$). No significant relationships were evident between the PCS measure and the various RPAQ scores.

The results of the analysis indicate that the hypothesis defined at the start of this study cannot be rejected.

Discussion

Exercise and PA programmes have been linked to improved levels of overall QoL in prison populations (Mannocci et al., 2015, 2017; Obadiora, 2016), however, the current study reveals specific relationships between PA and sedentary behaviour and the mental health domain of QoL. Investigation into the mental health of prisoners globally, indicates a higher prevalence of psychological disorders compared to the general population (AIHW, 2013; Condon, Hek & Harris, 2008; Fazel & Danesh, 2002; Fazel et al., 2016; Gullone et al., 2000; Mills & Kroner, 2005). Irish research has also identified a high incidence of affective mental disorders such as depression among its

prisoners (Davoren et al., 2015; The Minister of Justice, Equality and Law Reform, 2000).

Exercise and PA has been regularly associated with improved mental wellbeing (CDC, 2018; Fox, 1999; Ströhle, 2009; WHO, 2003). This association is also supported by prison-based research on PA and mental health (Bilderbeck et al., 2013; Buckaloo et al., 2009; Cashin et al., 2008; Gallant, Sherry & Nicholson, 2015; Mannocci et al., 2015; Woods, Hassan & Breslin, 2017). Most recently post-intervention analysis following the three-month exercise programme on male prisoners in Ireland, revealed an 81% positive change in four mental health symptom assessment scales, measuring depression, anxiety, stress, anger and self-esteem (O'Toole et al., 2018). Cardiovascular resistance training (CRT) and high-intensity strength training (HIST) protocols implemented in an Italian prison, both produced significant improvements in levels of depression (CRT: $p < .05$; HIST: $p < 0.1$) and near significant / significant improvements in anxiety levels (CRT: $p = .06$; HIST $p < .05$) compared to the control group (Battaglia et al., 2015). In addition, the CRT programme was identified to be the most effective at improving the mood and personal relationships of prisoners. Improvements in mood were also noted in the current study with one participant responding: "I feel better doing more" when asked why their exercise levels had changed since entry to prison. An increased sense of happiness among prisoners following involvement in sport was similarly recognised by Gallant et al. (2015). The aspect of social functioning (SF) is one of the main contributors to the MCS measure of QoL. Although no direct correlation was found in the current study between the SF

domain and PA levels of the prisoners, several studies along with Battaglia et al. (2015) have noted the positive social benefit for prisoners who are involved in PA and exercise allowing them to establish and maintain relationships and reinforce social skills (Condon et al., 2008; Digennaro, 2010; Lippke, 2003; Konstantinakos, Skordilis, Tripolitsioti & Papadopoulos, 2010; Martos-Garcia et al., 2009).

Research by Mannocci et al. (2017) revealed a significant direct association between the MCS of the SF-12 and MET minutes per week ($r = .099$, $p = .048$) concluding that consistent weekly activity (>600 MET·wk^{-1}) was associated with higher levels of mental health as measured by QoL. Although a significant association between MET scores and the MCS of QoL was not evident in the present study, the association between PAEE and MCS provides a positive basis on which to undertake further research. In contrast to the present study, Mannocci et al. (2017) had a significantly larger sample size ($n = 398$) for analysis.

Sedentary behaviours are typically associated with time spent sitting, reclining or lying down (Tremblay et al., 2017). There are however distinctions between the terms sedentary and inactive, where an individual can accumulate the recommended amount of daily PA but still spend large amounts of their day sitting or lying (Australian Government Department of Health, 2017; Owen et al., 2011). This is typical of the behaviours that can be observed in prisons. Prolonged periods of time are spent locked in cells with little movement, where the main activity is watching TV (Elger, 2009), regardless of an individuals' activity levels during unlock periods. Large amounts

of TV viewing are also evident in the current study. Weekday levels before six pm most frequently included 1 – 2 hrs·day^{-1} (23.8%, n = 20) and > 4 hrs·day^{-1} (22.6%, n = 19), while figures for weekdays after six pm and weekends before and after six pm all increased to > 4 hrs·day^{-1} (40.5%, n = 34; 27.4%, n = 23; 47.6%, n = 40). While all prisoners are supplied with a TV, only selected prisoners are given access to PlayStation consoles and therefore computer games usage was not as prominent, with an average frequency over all time periods of 1 – 2 hrs·day^{-1} for a maximum of seven participants. Increased TV viewing has been linked with higher risk of psychological distress and lower measures of mental health (Hamer, Stamatakis & Mishra, 2010).

While sedentary behaviour has been linked to several physiological health conditions (Biswas et al., 2015; Ekelund et al., 2016; Grøntved & Hu, 2011; Howard et al., 2008; Shen et al., 2014; Ukawa et al., 2013; Wilmot et al., 2012), research of its effects on psychological wellbeing is limited. Sloan et al. (2013) and Hamer, Coombs and Stamatakis (2014), found that sedentary time was directly associated with psychological distress. People reporting 10 hrs·day^{-1} of sedentary behaviour, independent of being active, were 29% more likely to report with psychological distress (Sloan et al., 2013). Although the median sedentary time in the current study was 6.4 hrs·day^{-1}, the maximum sedentary time of some participants reached 16 hrs·day^{-1}. Moderate evidence also exists suggesting a link between sedentary behaviour and mental health issues such as anxiety (Rebar, Vandelanotte, Van Uffelen, Short & Duncan, 2014) and depression (Teychenne, Ball & Salmon, 2010). Unfortunately, the underlying basis for these links is unclear and poses a cause or

effect scenario, where the individual may engage in sedentary behaviour as a coping mechanism for mental health issues (Teychenne, Costigan & Parker, 2015). It is worth noting also, that there was no available research on the effects of sedentary behaviours on the mental wellbeing of people in prison.

While the analysis of the current research has shown significant relationships between PA and sedentary behaviours and the mental health domain of QoL, the coefficient of determination values of each correlation indicates only a small percentage of the factors accounting for variability are common in both variables. It is clear therefore, that exercise and PA are not the only factors involved in influencing the mental health of prisoners.

Limitations

While the researcher is aware of the application of a Bonferroni adjustment to avoid a type I error, this correction was not applied in this case due to the relatively small sample size and the predetermined objectives of the study. Had the adjustment been applied, significant correlations would have been overlooked.

The results of the RPAQ produced large discrepancies in the PA and EE scores of participants'. This large spread of results meant that several outliers appeared in the statistical analysis. These outliers may have had an overall effect on the PAEE and total MET hour scores and in turn affected correlation analysis with the QoL summary measures.

The use of self-reported questionnaires was deemed the most appropriate method for this current study, however, it is understood that self-reporting may be problematic. Although measures were taken during the design of the questionnaires, it is possible that participants may not fully understand the context in which the questions were presented and as a result answers may not reflect reality. The possibility also exists that prisoners may be reluctant to admit to mental health problems in the apprehension that it may cause them to be stigmatised or negatively affect their sentence plans and therefore respond in what they consider a more socially acceptable manner.

Slight errors were observed in the response options for the demographic questions relating to sentence length and activity levels prior to prison, post distribution. However, these errors would not have affected overall correlation scores.

Future research

This study has highlighted the need for further research into the relationship between PA and the QoL of Irish prisoners. As the first quantitative analysis of this nature completed within an Irish prison, it would be valuable to carry out similar research on a larger scale incorporating all the closed prisons within Ireland.

There is also need for more PA interventions to be undertaken, to directly assess the effects of PA on prisoners' physical and mental health compared to control groups, a feature which was absent in O'Toole et al. (2018).

Conclusion

This study has been an important step in addressing the effects of exercise on the QoL of Irish prisoners. Although the correlation was low, a positive relationship has been observed between PAEE and the MCS measure of QoL. The results however, show a large variance in the PA scores of individuals, with the daily activity levels of some prisoners extremely low. The aspect of sedentary behaviour is a large factor of prison life and is reflected in the results with a negative relationship associated with the mental health domain of QoL.

Although opportunities for exercise and PA are provided in prison, participation is not mandatory. The implementation of PA is however, an easily modified behaviour that can be undertaken by people in prison which can contribute to improvements not only in mental wellbeing but also in aspects of their physical health. It is an area that needs greater emphasis and encouragement from prison management and health care providers within the Irish prison system.

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Appendices

Approval 2017/18

University of Chester

Faculty of Medicine, Dentistry and Life Sciences
Research Ethics Committee
frec@chester.ac.uk Monday, 19 February 2018

Fiona Dooley
Castlegrove
Tuam
Co. Galway
Ireland

Dear Fiona,

Study title: A quantitative analysis of exercise and physical activity practices of males in an Irish prison and its impact on quality of life.
FREC reference: 1364/17/FD/CSN
Version number: 1

Thank you for sending your application to the Faculty of Medicine, Dentistry and Life Sciences Research Ethics Committee for review.

I am pleased to confirm ethical approval for the above research, **provided** that you comply with the conditions set out in the attached document, and adhere to the processes described in your application form and supporting documentation.

The final list of documents reviewed and approved by the Committee is as follows:

Document	Version	Date
Application Form	1	November 2017
Appendix 1 – List of References	1	November 2017
Appendix 2 – Summary CV for Lead Researcher		
Appendix 3 – Risk Assessment	1	November 2017
Appendix 4 – Participant Information Sheet [PIS]	2	February 2018
Appendix 5 – Written permission(s) from relevant personnel (eg. to use facilities)	1	November 2017
Appendix 6 – Validated questionnaire(s)	3	February 2018
Appendix 7 – Non-validated questionnaire(s)	1	November 2017
Appendix 8 – Confirmation of Garda Clearance	1	November 2017
Appendix 9 – Psychology Services Information Leaflet	1	January 2018
Appendix 10 – Consent Form	1	January 2018

Approval 2017/18

Appendix 11 – Research Poster	1	January 2018
Appendix 12 – Participation Invitation Letter	1	February 2018
Appendix 13 – G*Power Calculation	1	February 2018
Response to FREC request for further information or clarification	2	February 2018

Please note that this approval is given in accordance with the requirements of English law only. For research taking place wholly or partly within other jurisdictions (including Wales, Scotland and Northern Ireland), you should seek further advice from the Committee Chair / Secretary or the Research and Knowledge Transfer Office and may need additional approval from the appropriate agencies in the country (or countries) in which the research will take place.

With the Committee's best wishes for the success of this project.

Yours sincerely,

Professor Ben Green
Chair, Faculty Research Ethics Committee

Enclosures: Standard conditions of approval.

Cc. Supervisor/FREC Representative

The Research Office
Irish Prison Service College
Brian Stack House
Dublin Road
Portlaoise
County Laois

An Oifig Taighde
Coláiste Seirbhís Phríosúin
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Fax/Facs: (057) 862 0946

Proposed study – A Quantitative Analysis of Exercise and Physical Activity Practices of Males in an Irish Prison and its Impact on the Quality of Life

The Irish Prison Service Research Office will grant access to Ms Fiona Dooley to undertake research for the proposed study **– A Quantitative Analysis of Exercise and Physical Activity Practices of Males in an Irish Prison and its Impact on the Quality of Life**

This access is contingent on the ethical approval of the proposed research by the appropriate ethics body and agreement with the following conditions.

- A copy of the completed research paper could be lodged in the Research Repository, Irish Prison Service College.
- The IPS will be granted prepublication access to the research paper for right of reply.
- The research methodology cannot interfere with the operations of the prison.
- The grant of approval does not convey the right of access across the prison estate. Access is contingent on available prison resources.

If you require any further information in relation to the Research Office, Irish Prison Service please do not hesitate to contact the above office.

Raphael O'Keeffe
Research Officer
10 October 2017

University of Chester

Invitation Letter

Dear Sir,

You are invited to take part in a research project based in Mountjoy Prison.

I am doing this research as part of my Masters Degree in Exercise and Nutrition Science in the University of Chester. As part of this project I will be collecting information on the exercise and physical activity levels of male prisoners and will be looking at how this might affect mental health and quality of life.

All information is confidential, and no names will be used throughout the project.

The survey will ask you about the different types of exercise and physical activity you take in prison and will also ask you some questions about your physical and mental health.

If you would like to take part in this research I will be visiting your landing on … at … o'clock.

If you have any further questions, please come and talk to me in the school.

Regards,

Fiona Dooley
(PE Teacher)

University of Chester

Participant Information Sheet

Exercise and physical activity in a male prison and how it affects quality of life.

You are invited to take part in a study. Before you decide, it is important for you to understand why this is being done and what it will involve. Please take time to read this information carefully and ask me if there is anything that is not clear. Take time to decide if you would like to take part.

Thank you for reading this.

What is the purpose of the study?
The project will look at physical activity and quality of life of prisoners in Mountjoy.

Why have I been chosen?
You have been chosen because you are in Mountjoy prison.

Do I have to take part?
You do not have to take part if you don't want to. You are free to withdraw at any time without giving a reason.

What will happen to me if I take part?
You will fill out a questionnaire which will look at your physical activity levels and your quality of life. You do not use your name in the questionnaire.

What are the possible disadvantages and risks of taking part?
There are no disadvantages or risks in taking part in the study.

What are the possible benefits of taking part?
It will help the researcher to understand more about physical activity in prison.

What if something goes wrong?

If you have any concerns about the way you have been approached or treated during this study, please contact Dean of the Faculty of Medicine, Dentistry & Life Sciences, University of Chester, Parkgate Road, Chester, CH1 4BJ, England.

Will my taking part in the study be kept confidential?

All information which is collected about you will be kept strictly confidential. Only the researcher will have access to that information.

The data collected from this project may be kept and published but no names will be used. By agreeing to take part in this project, you are agreeing to the keeping and publication of data.

What will happen to the results of the research study?

The results will be written up into a report for the final project of a University of Chester course by Fiona Dooley a student at that college and the P.E teacher in Mountjoy. People who take part will not be named in any report.

Who may I contact for further information?

If you would like more information about the research before you decide if you want to take part, please contact:

Fiona in the Education Centre

Thank you for your interest in this research.

Would you like to take part in an anonymous survey?

Fiona from the school is doing research on the effects of physical activity on the quality of life of prisoners in Mountjoy.

Date … / Time …

Everyone is welcome to take part

No names will be used

If you have any questions, please see **Fiona** (circuits/yoga teacher) in the school

Who can I talk to?

Psychology	Listeners
If you would like to talk to a psychologist, ask the following people to help you make an appointment A.C.O / Chief Class officer I.S.M officers Medics Fiona in the school	A listener is a trained prisoner you can talk to who will offer you confidential support. You can speak to a listener any time of the day or night. Ask your class officer if you would like to speak with a listener.

University of Chester

Title of Project: Exercise and physical activity in a male prison and how it affects quality of life.

Name of Researcher: Fiona Dooley

Please tick box

1. I confirm that I have read and understand the information sheet and have had the chance to ask questions. ☐

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason. ☐

3. I agree to take part in the above study. ☐

_____	_____	_____
Name of Participant	Date	Signature
_____	_____	_____
Researcher	Date	Signature

RPAQ (modified)

Recent Physical Activity Questionnaire

This questionnaire is designed to find out about your physical activity in your everyday life in the last 4 weeks

This questionnaire is divided into 3 sections

Please try to answer every question.

- **Section A** asks about your physical activity patterns in your cell, around the landing and in the prison
- **Section B** is about your activity at work
- **Section C** asks about recreations that you may have engaged in during the last 4 weeks.

Your answers will be treated as strictly confidential and will be used only for research.

Section A – Activities in the cell, on the landing and around the prison

TV, DVD or Video Viewing (Please put a tick (✓) on every line)

Hours of TV, DVD or video watched per day	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6 pm						
On a weekday after 6 pm						
On a weekend before 6 pm						
On a weekend after 6 pm						

Computer game use in your cell E.g. Playstation, Xbox

(Please put a tick (✓) on every line)

Computer game use per day	Average over the last 4 weeks					
	None	Less than 1 hour a day	1 to 2 hours a day	2 to 3 hours a day	3 to 4 hours a day	More than 4 hours a day
On a weekday before 6 pm						
On a weekday after 6 pm						
On a weekend before 6 pm						
On a weekend after 6 pm						

Stair climbing (Please put a tick (✓) on every line)

Number of times you climbed up a flight of stairs (10 steps) each day	Average over the last 4 weeks					
	None	1 to 5 times a day	6 to 10 times a day	11 to 15 times a day	16 to 20 times a day	More than 20 times a day
On a weekday						
On a weekend						

Section B – Activity at work

Please answer this section if you have had a job at any time **during the last 4 weeks**

- Have you had a job during the last 4 weeks? Yes ☐ No ☐

If you answered **No** please skip to **Section C**.

During the last 4 weeks how many hours work did you do per week?

	4 weeks ago	3 weeks ago	2 weeks ago	1 week ago
Work hours				

Type of Work

What type and amount of physical activity is involved in your work?
Please tick (✓) the option that best matches your job in last 4 weeks.

Please tick only one of the following

1. **Sedentary job**

You spend most of your time sitting (such as in an office) ☐

2. **Standing job**

You spend most of your time standing or walking. However, your work does not require intense physical effort. ☐

3. **Manual job**

This involves some physical effort including handling of heavy objects ☐

4. **Heavy manual work**

This is very vigorous physical activity including the handling of very heavy objects ☐

Section C – Recreation

The following questions ask about how you spend your leisure time.

Please indicate how often you did each activity over the last 4 weeks.

Please indicate the average length of time that you spent doing the activity on each occasion.

Please give an answer for the **number of times** you did the following activities in the past 4 weeks and the **average time** you spent on each activity

Please complete **each** line

	Number of times you did the activity in the last 4 weeks							**Average time per episode**	
	None	Once in the last 4 weeks	2 to 3 times in the last 4 weeks	Once a week	2 to 3 times a week	4 to 5 times a week	Every day	Hours	Minutes
Walking			✓						30
High Impact Aerobics or step aerobics				✓				1	10

Example

Now complete the table on pages 5 and 6

	Number of times you did the activity in the last 4 weeks							**Average time per episode**	
	None	Once in the last 4 weeks	2 to 3 times in the last 4 weeks	Once a week	2 to 3 times a week	4 to 5 times a week	Every day	Hours	Minutes
Walking									
DIY									
High Impact Aerobics or step aerobics									
Other type of Aerobics									
Exercise with weights									
Conditioning exercises e.g. using a bike or rowing machine									
Floor exercises e.g. stretching, yoga									
Jogging									
Badminton									
Table tennis									

	Number of times you did the activity in the last 4 weeks							Average time per episode	
	None	Once in the last 4 weeks	2 to 3 times in the last 4 weeks	Once a week	2 to 3 times a week	4 to 5 times a week	Every day	Hours	Minutes
Football									
Volleyball									
Snooker, Pool									
Musical instrument playing or singing									
Martial arts, boxing or wrestling									

SF-12v2 Health Survey (modified)

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities.

Answer each question by choosing just one answer.

If you are unsure how to answer a question, please give the best answer you can.

1. In general, would you say your health is:				
Excellent ☐	Very Good ☐	Good ☐	Fair ☐	Poor ☐

2. The following questions are about activities you might do during a typical day. Does your current health limit you in these activities? If so, how much?			
	Yes, limited a lot	Yes, limited a little	No, not limited at all
a. **Moderate activities** such as moving a table, sweeping, playing pool/snooker, walking the yard	☐	☐	☐
b. Climbing **several** flights of stairs	☐	☐	☐

3. During the **past 4 weeks**, how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?					
	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. **Accomplished less** than you would have liked	☐	☐	☐	☐	☐
b. Were limited in the **kind** of work or other activities	☐	☐	☐	☐	☐
4. During the **past 4 weeks,** how much of the time have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?					
	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. **Accomplished less** than you would have liked	☐	☐	☐	☐	☐
b. Did work or other activities **less carefully than usual**	☐	☐	☐	☐	☐
5. During the **past 4 weeks**, how much **did pain interfere** with your normal work?					
Not at all	A little bit	Moderately	Quite a bit	Extremely	
☐	☐	☐	☐	☐	

6. These questions are about how you feeland how things have been with you during the **past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling.

How much of the time during the past 4 weeks…

	All of the time	Most of the time	Some of the time	A little of the time	None of the time
a. Have you felt **calm and peaceful**	☐	☐	☐	☐	☐
b. Did you have a **lot of energy**	☐	☐	☐	☐	☐
c. Have you felt **down-hearted and low**	☐	☐	☐	☐	☐

7. During the **past 4 weeks,** how much of the time has your **physical health or emotional problems** interfered with your social activities (like chatting with friends, socialising with others on the landing?)

All of the time	Most of the time	Some of the time	A little of the time	None of the time
☐	☐	☐	☐	☐

- What is your age _____

- What is the length of your current sentence?

0 to 5 years	5 to 10 years	10 to 15 years	15 + years
☐	☐	☐	☐

- What age did you leave school? _____

- Before coming to prison how often did you take part in exercise/physical activity

Never	Once a week	2 to 3 times a week	3 to 4 times a week	4 to 5 days a week	5 to 6 days a week	Most days of the week
☐	☐	☐	☐	☐	☐	☐

- On average, how intense was your exercise before coming to prison

Strenuous exercise (heart beats rapidly)	Moderate exercise (not exhausting)	Mild Exercise (little effort)
☐	☐	☐

- Do you think your exercise/physical activity levels have changed since coming to prison?

  Yes ☐ **No** ☐

- Why have they changed?

_____

_____

_____

Participants' response to why exercise levels have changed since coming to prison.

"Stress"

"Because I have been able to play football in the exercise yard"

"More to do, gym, football available"

"I have become lazy and was never really into the gym and there's nothing else to do"

"I have become fitter"

"They have changed because…"

"The gym and activities are very limited, makes working out harder and the diet in prison is hard to train and see results"

"Head just hasn't been in it, thinking about the outside a lot of the time, partner, children etc"

"Because I'm not in a full-time job"

"I go the gym, never did outside"

"In prison the gym is free so I'm focusing more on my health, physical and mental"

"Have a lot more time on my hands to concentrate on training"

"Gym never open, so got sick of trying and got a job instead"

"Exercise more, eat less"

“Just the med staff, just panicking all the time”

“Because my heads been all over the place”

“I have nothing else to do except the gym”

“Lack of proper food”

“Because of my confinement”

“Keep me occupied”

“Cause doing a lot of exercise”

“More sitting down”

“I’m not as fit as I used to be”

“There’s not a lot to do, the gym keeps me going and busy in here”

“Cause of the restriction of prison, everything is very slow”

“Usually I was spending around 12 – 14 hours outside my house working or exercising, mountain walking, walking my dog”

“I’ve done more”

“Something to do”

“Boredom, enjoy the gym”

“I feel more …”

"Because I start to train on a regular basis. I train twice a day, 6 days in a week, morning cardio, second session weights lifting. And I am doing a number of sports related courses and I understand what I'm doing and my body composition and VO2 max still improving"

"Just down to my own fault drug taking"

"I feel better doing more"

"I have more energy"

"More energy in the gym. More time, gym is close, more motivated to leave prison in good shape"

"I'm back training and was not on the outside"

"I do have a lot more energy with the activities that I am doing through the week I do more exercise now"

"I am not doing as much as I used to do"

"Because when I was on the outside I used to sleep little bit and now I sleep a lot. That's why it's good to sleep before you train any exercise"

"Because they are limited"

"Stress"

"Because I would be more active with the gym, walking, yoga, cleaning"

"More time to do gym"

"I had a bad drugs habit on the outside"

“They have become structured throughout the day. On the outside exercise had to fit in with my other responsibilities, whereas now I have to do it at specific times. I also use the gym now, whereas on the outside all my exercise was done in the outdoors”

“I am getting much less exercise, some of my usual activities are not permitted in prison”

“Not working, doing scaffolding and gardening. Going for walks with daughter and dog”

“I’m working more hours every day in prison than I did at home”

“Lack of ambition/motivation/vision”

“I have got a lot fitter”

“Very little motivation to start using the gym but I do like to go out walking in the yard everyday”

“Keep busy, kill time, keep occupied”

“Wanting to get healthy”

“Was better motivated before prison and access to gym was not restricted as it is now. I also trained with friends and family (social aspects to training before)”

“Because I am not abusing my body the way I used to so I feel good most of the time”

“I’m in a prison and there is nothing to do”

“Because you get better sleep times and plenty of gym”

“Things are never open because not enough staff to run services”